True-to-Hume Laws and the Open-Future (Or Hypertemporal Humeanism)

Abstract

Take open-future Humeanism to comprise the following four tenets: (T1) that truth supervenes on a mosaic of local particular matters of fact (T2) that there are no necessary connections between distinct existences (T3) that there is a dynamic present moment, and (T4) that there are no future facts; that is, contingent propositions about the future obtain truth values only when their referents are actualised (Tooley 1997). Prima facie this is a deeply problematic metaphysic for the Humean, since given that the widely accepted Humean conception (that of David Lewis 1986a) takes all truths (inclusive of nomological truths) to supervene on an omnitemporal mosaic of local particular matters of fact, if there are no future facts then the Humean can neither provide laws of nature, nor justify many everyday inductive inferences (Hüttemann 2014). However, I argue that this eternalist metaphysic is in tension with at least one of Hume's central metaphysical claims concerning causation e.g., that causal regularities may cease to hold at any time. In this paper I propose and defend one possible open-future Humean metaphysic which admits of 'true-to-Hume' causal and nomological facts. Furthermore, although I am happy to concede that induction is problematic for the open-future Humean, I demonstrate that it poses no greater threat to the open-future conception than it does to the popular Lewisian conception of natural law.

Paper

1. Introduction

Take Growing-Block Humeanism to comprise the following four tenets: (T1) that truth supervenes on a four-dimensional mosaic of local particular matters of fact (T2) that there are no necessary connections between distinct existences (T3) that there is a dynamic present moment, and (T4) that there are no future facts; that is, contingent propositions about the future obtain truth values only when their referents are actualised (Tooley 1997). Prima facie this is a deeply problematic metaphysic for the Humean; given that the widely accepted Humean conception of laws (David Lewis 1986a) takes all truths (inclusive of nomological truths) to supervene on an omnitemporal mosaic of local particular matters of fact, if there are no future facts, then the Humean can neither provide laws of nature, nor justify many everyday inductive inferences (Hüttemann 2014). However, I argue that the eternalist metaphysic that the contemporary Humean tends to espouse is in tension with some of David Hume's key causal claims, most prominently, his belief that causal regularities can fail at any time.

In this paper I propose and defend a new and alternative Humean view (Hypertemporal Humeanism) based on a growing-block Humean metaphysic, and the notion that laws supervene upon four-dimensional hypertemporal 'moments'. This metaphysic admits of what I call '*true-to-Hume'* nomological facts, and satisfies the four ontological and conceptual commitments outlined above. I do not intend to prove that Hypertemporal Humeanism is the *only* option for an open-future Humean metaphysic, nor do I claim that it is better than any alternatives. Rather, I propose one possible metaphysic that overcomes

the ‘no laws’ objection outlined in section *3*, and explain why the view requires laws to supervene upon ‘hypertimes’ if it is to accommodate Hume’s sceptical worries.

Furthermore, although I am happy to concede that induction is problematic for the open-future Humean, I show that it poses no greater threat to the open-future conception than it does to the Lewisian conception of natural laws.

2. Why Be an Open-Future Humean?

There are many possible reasons for endorsing open-future Humeanism. First (following Lewis), most contemporary Humeans are eternalists - they believe that all events, whether past, present, or future, are equally real. But many find the idea that there is no ontologically privileged present moment deeply unsatisfying (McTaggart 1908; Markosian 2004; Tallant 2009, 2012). I am not going to argue here whether one should or should not desire a privileged present in one’s ontology, but the form of open-future Humeanism I present here, Hypertemporal Humeanism, will satisfy those who do.

For those who think the present moment is special in some metaphysical sense, there are at least two ways of resolving the problem for the Humean: first, one might endorse a view such as that proposed by Ross Cameron (2015). Cameron’s conception maintains the reality of all temporal moments, but imposes an objective dynamic present in the form of a ‘moving spotlight’. A detailed discussion of this view is beyond the scope of this paper, however. Second, one might endorse a ‘growing-block theory’, according to which more and more temporal moments come into, and stay in existence as the present moves inexorably forward; it is this growing-block ontology that I explore in the context of open-future Humeanism.

One may wish to be a Humean and endorse T1, but take future contingents not to (presently) have determinate truth-values. However, if one assumes there to be just one omnitemporal four-dimensional block, and take truth to supervene on being, then truth values are *prima facie* fixed for all times. However, as I demonstrate later, when one denies the existence of future property instances and maintains a commitment to T1 there can be no truth-values for contingent propositions about the future. This naturally entails open-future Humeanism.

3. The No Laws Objections

Let us take a metaphysic to be 'Humean' if and only if it asserts that worldly facts are determined by a four-dimensional mosaic/block of fundamental property instantiations, and the fundamental spatiotemporal relations between them (Lewis 1973, 1986; Beebee 2000). For the Humeans, the laws of nature do not determine or govern the patterns of property instantiation (in worlds like ours) through some invisible metaphysical glue, rather the patterns of property instantiation determine the laws. Lewisian Humeanism is generally viewed as a closed-future conception, according to which all facts about the universe (including those about events in the future) are fixed[1] by a *complete* supervenience base: a four-dimensional mosaic comprising every event that will ever be. When contemporary philosophers talk of Humeanism, typically they assume the Lewisian conception (the conjunction of 'best systems' Humeanism[2] and eternalism). I do not, for reasons that shall become clear.

[1] Here the term 'fixed' is not used to imply that something (say, laws of nature) metaphysically *determines* the facts, merely that all propositions about thisworldly states of affairs across all of space and time have omnitemporal, unchanging truth-values (including, in the case of indeterministic worlds, facts about chancy events).
[2] See section *6.*

The Lewisian view entails that all contingent propositions (including future contingents and natural laws) have determinate truth-values. This is not so clear if one endorses a conception of Humeanism with an incomplete mosaic[3]. If truth supervenes on being and the future does not exist, then there is nothing for future truths to supervene upon, and perhaps more worryingly, a substantial part of the supervenience base necessary for nomological truths is missing. Andreas Hüttemann (2014) argues for this conclusion, using it to highlight the implausibility of the view. Below I outline **NOLAWS**, an argument based crudely on Hüttemann's findings[4].

NOLAWS

- P1. The explicans for uniformities in nature allow one to make inductive inferences.
- P2. The only explicans for uniformities in nature are natural laws.
- P3. The Humean requires a *complete* supervenience base in order to provide nomological facts about world *w.*
- P4. According to open-future Humeanism, *w* is incomplete, as *w*'s supervenience base ends with the objective present moment.
- C1. *There are no nomological facts about w for the open-future Humean.* (P3,P4)
- C2. Open-future Humeanism *can provide no explanation for uniformities in nature*. (P2,C1)

[3] Where there are no realised future property instances.

[4] HÜttemann argues that without laws, the Humean cannot account for our experience of the 'recalcitrance' of nature'; we feel Nature 'pushing back' when we try to compress air, as she will not allow Boyle's Law to be violated – open-future Humeanism seems to rule out laws of nature, and without Boyle's law, what explains this experience?

- C3. *The Open future Humean cannot justify inductive inferences.* (P1, C2)

According to **NOLAWS** the apparent commitment to denying bivalence gives rise to serious problems: given (a) that laws supervene upon the *complete* mosaic of local particular matters of fact, and (b) that the supervenience base available to open-future Humeans includes only past and present facts, her ontology is not rich enough to provide nomological facts (this paper is primarily concerned with C1, but issues related to C2 and C3 will be discussed in the closing sections). In *S5*, however, I show that **NOLAWS** is successful only if several standard but unwarranted assumptions are made, and that the open-future Humean *can* in fact endorse a plausible metaphysic that supports nomological truths.

*4. Diffusing **NOLAWS***

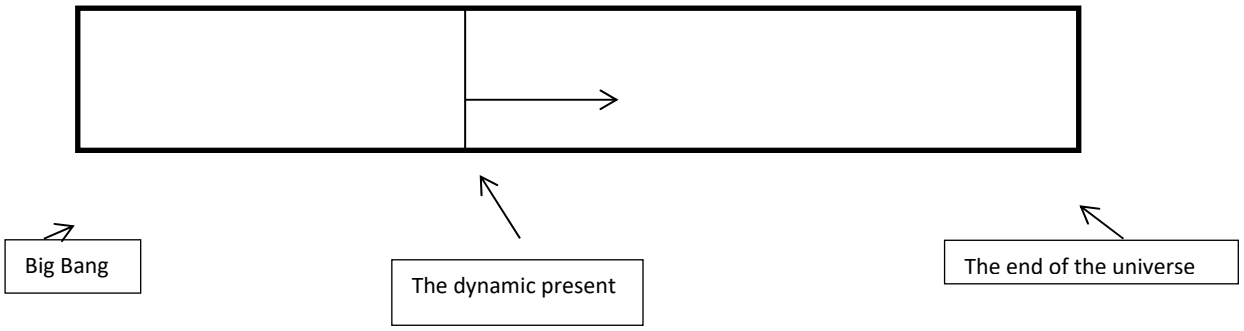
In order to provide a plausible open-future Humeanism metaphysic one must first identify its basic ontological features. To this end, in this section I outline the three most prominent conceptions of time, and argue that the open-future Humean should endorse the growing-block view. These three concepts are best distinguished by differences in their ontological commitments:

Presentism

Presentists believe in an ontologically privileged moment that flows uniformly from the past and into the future. They believe that everything that exists does so in the present moment[5], that events in the past were real but no longer are, and that future events do not and have never existed, but will do when they are in the present.

[5] See figure 1 – this presentist block represents time running from past to future (left to right), the grey line represents the domain of existence (in this case, only the present).

Figure 1. PRESENTISM



Although presentism is widely thought of as the common-sense conception of time (Markosian 2004), it is *prima facie* ill-suited to Humean conceptions. The thesis provides only a very small supervenience base, as only those property instances at the present moment exist; thus not only would there be no truth values for contingent propositions about the future, but there would also be no truth values for those about the past. Presentism therefore looks unlikely to support any plausible Humean conception of laws.

B Theory Eternalism

B Theory Eternalism (Eternamlism), the view embraced by most Humeans, is (crudely) the view that every object-involving event that is, has been, and ever will be are ontologically on a par[6]. Not only are there facts about the battle of Hastings and the 2018 FIFA World Cup final (which is in the future, at the time of writing), but the events corresponding to these facts are every bit as real as the event of me typing at my computer right now[7]. As for the present moment: for the eternalist there is no privileged dynamic present - the 'present'

[6] See figure 2 – this eternalist block contains all the events that will ever take place in the actual world, all of which are actual. The present moment has no special ontological status.

[7] This is the ontology espoused by David Lewis (and indeed most Humeans), and is commonly thought to be that which best suits Humean conceptions of laws, as the *complete* four-dimensional mosaic of property-instantiations is a tangible entity (Lewis, 1986) upon which all truths, including nomological truths, can supervene.

and the 'now' are indexical terms equivalent to the 'here' in a spatial context, so although one may *think* that time is flowing and that the only real objects are those in the present moment, many of one's earlier and later temporal parts are equally real and equally incorrectly thinking the same thing. The eternalist, then, believes that time is a static phenomenon, and that the only 'present' one can make sense of is *subjective*. This conception of time, in its most basic form, is also ill-suited to open-future Humeanism[8]. If truth supervenes on being, and all property instantiations (past, present, and future) are realised, then the truth-values of all future contingents are timelessly fixed.

Figure 2. ETERNALISM[9]

Growing-block Theory

Michael Tooley (1997, 109) argues that static accounts of time (like eternalism) cannot account for the fact that a cause and a causal law raises the probability of the cause's effect, but an effect plus a causal law does not raise the probability of the effect's cause. He further argues that this asymmetry is best explained by an ontological asymmetry between the past and present, and the future. From the ontological asymmetry necessary for causation and

[8] There are 'branching block' versions of eternalism that accommodate an open future (Skow 2015). As with figure 2, branching blocks are four-dimensional blocks of property instances, but rather than just one time line, they 'branch' such that many possible futures are realised. If laws supervene upon all existing property instances (as per T1), then all the 'branches' form a part of the supervenience base. It follows that the regularities in other branches affect the laws of your own, which seems at best counterintuitive. My thanks to an anonymous referee for bringing this open-future Humean option to my attention.

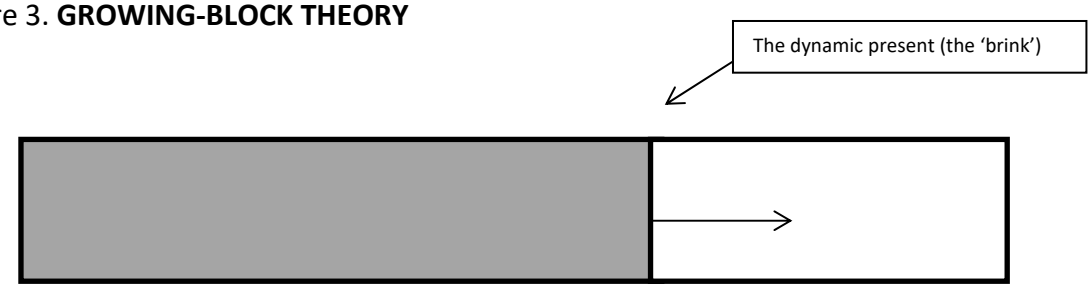
[9] The grey fill indicates the existence of the events included in the timeline – compare with figures 1 and 3. As with figures 1 and 3, this block represents events from the first until the final temporal moment.

the dynamism it entails is born a compromise between the two conceptions considered thus far: growing-block theory[10]. Growing-block theorists believe the domain of what is real is devoid of future events, but inclusive of all those of the past and present. It thus manifests aspects of both presentism and eternalism;[11] the former insofar as there is a dynamic present that flows uniformly from the past and into the future, and the latter insofar as more than just those things in the present moment exist.

With respect to contingent future-tensed propositions, the growing-block theorists can be divided into two factions. Past and present facts for both the open- and closed-future growing-block theory are clearly fixed, but depending on one's metaphysics of natural law and causation, one can either take contingent facts about the non-existent future to be fixed before the events they refer to are actual, or one can take them to be (presently) indeterminate, whereby facts about future events become fixed only when the present moment, that is, the 'brink' of the growing-block, reaches them. Although Tooley's metaphysics of laws fundamentally differs from that of the Humean's (for Tooley the world is 'governed' laws of nature), open-future Humeanism fits naturally with the growing-block theorist, since (i) the existent past provides a more substantial supervenience base than presentism, and (ii) since there is no real future upon which facts can supervene, the open future can be accommodated. This in itself does not resolve **NOLAWS**, but nonetheless, the open-future Humeanism conception proposed in this paper employs a growing-block ontology.

[10] Note that Tooley's conception of causal laws differs significantly from the Humean's, so it is immediately clear that the same motivations are available for the Humean. However, a Humean might well provide a probability-raising account of causation that is similar to Tooley's in the manner relevant to his argument.
[11] See also C. D. Broad (1923)

Figure 3. **GROWING-BLOCK THEORY**



5. Assumptions and Terminology

Before proceeding with my tentative proposal for a new open-future Humean metaphysic, I must first outline a number of assumptions and terminology.

(i) Assume the *folk* conception of 'time' whereby (1) in the actual world time begins with the Big Bang (at least, that will be presupposed in this paper) and may or may not end at some point in the future; (2) every event that occurs (or at least those that have occurred) does so at some determinate moment in time; (3) one can put events in a fixed temporal order, associating each moment with a number; and (4) there are temporal relations between events (the Battle of Hastings, for example, took place in 1066CE - 900 years before Bobby Charlton and his England teammates won the 1966 World Cup)[12].

(ii) According to the conception of 'hypertime' invoked in this paper, each hypertemporal moment (unlike each temporal moment) provides a precise history of a world 'thus-far', as it is the supervenience base for all thisworldly propositions with determinate truth-values (up to and including the 'present' moment in time). Hypertimes are thus determinate four-dimensional blocks of property-instantiations.

[12] Special relativity suggests that such an objective temporal order might be misguided. My argument, however, does not require special relativity to be false (see John Earman's 2008 for a discussion of relativistic models of temporal becoming). Besides, any issues that may arise due to relativity theories for the view espoused in this paper will be equally problematic for the standard Lewisian.

In the actual world, the first hypertime contains only the event 'The Big Bang', and all subsequent hypertemporal moments are progressively larger four-dimensional mosaics (see figure 1). That is not to say that each hypertemporal moment is a distinct world from the last – the Helen of the hypertemporal present is not a counterpart of the Helen in the hypertemporal past, but the very same person. 'Hypertemporal moments' are thus mosaics of local particular matters of fact, with each hypertemporal moment containing all the same property-instances as its predecessor, but with one temporal-moment's worth of (temporally later) property-instances in addition.

This notion is helpful when quantifying over events in the growing-block conception of time. For the growing-block theorist, more object-involving events come into being as the present temporal moment moves forward, but only the events 'at a time' exist at each temporal moment. Thus if one quantifies over all the events at *time* 1970CE one quantifies only over those events in 1970CE (events involving lots of people wearing flared trousers, and no events involving dinosaurs), but if one quantifies over all those events at the *hypertime* ending in 1970CE, one quantifies over all events from The Big Bang up to and including those of 1970CE[13]. Thus in every hypertemporal moment, it is true to say that all events contained in that moment, occur in that moment; thus the same event will occur at many different hypertimes, but only at one time (the same time in every hypertime).

(iii) Let us assume that there *are* laws of nature. The 'epistemic problem of laws' questions our justification for believing we have discovered the actual laws of nature. For David Armstrong (1983), for example, this is a matter of justifying beliefs about what the universals are, and between which of them natural necessitation relations hold; for the

[13] More on growing-block theory and hypertime later.

Humean, it is a matter of justifying beliefs about which properties are always co-instantiated (the regularities).

(iv) One might conclude that one cannot resolve the epistemic problem of laws, but that is not to say the actual world is a lawless one. Indeed, Lewis's Humean conception (with *complete* mosaics) *entails* that if there are regularities then there are laws of nature (although they may not be those we currently assume them to be)[14]. The 'metaphysical problem of laws', on the other hand, faces metaphysicians who have a coherent conceptual analysis of laws, but do not have an ontology 'rich' enough to supply them; that is, if metaphysical thesis M states that laws are entities of type L, but their metaphysical thesis entails no Ls, then M has no laws and is subject to the metaphysical problem of laws[15]. Since contemporary Humeans take nomological truths to supervene upon an *omnitemporal* mosaic of local particular matters of fact, it seems the open-future Humean view must fall foul to precisely this objection.

6. Hypertemporal Humeanism: A Novel (but tentative) Solution to ***NOLAWS***

According to David Hume's 'Naïve Humeanism' laws are regularities in nature - universal generalisations of the form $\forall x(Fx \rightarrow Gx)$. With no further conditions stipulated this analysis is plagued by counterexamples[16], but Lewis (1973; 1986a) sophisticates the position to a 'best systems approach', avoiding many of the naïve theory's problems. From an ontological perspective Lewis's laws are, just as the naive Humean's, nothing more than omnitemporal and omnispatial regularities, but for the Lewisian the domain of laws is significantly smaller

[14] We infer the laws based on observed-regularities, but it is metaphysically (and perhaps even physically) possible for these law-like regularities to change.
[15] Of course some metaphysicians might think this is not a problem, and deny that there are laws – in which case calling it a 'problem' might be misleading.
[16] See Armstrong 1986 for why Naïve Humeanism implies vast numbers of accidental regularities falling under the domain of laws.

than that of its 'naïve' equivalent - only those regularities that describe the uniformities of nature with the best combination of simplicity and strength are deemed to be laws of nature, and these cohere roughly with those of scientific practice.

I have assumed the Humean mantra to be simply that truth supervenes on a mosaic of local particular matters of fact (T1) with no necessary connections between them (T2). From an ontological perspective, then, the Lewisian conception does not differ from Naïve Humeanism in any significant respect; it is only the *conceptual* analyses of laws and causation that demarcate the theses, and Lewis's view is better only insofar as it is more compatible with our intuitions and best scientific theories[17]. In short, so long as T1 and T2 are satisfied, the metaphysic in question is Humean through and through.

As we have seen, Hütteman convincingly argues that the Lewisian concept of laws, when applied to an open-future, entails lawlessness. This is due to the lack of the omnitemporal and omnispatial supervenience base necessary for nomological facts[18]. Hume may not have identified this as problematic, but he does not explicitly discuss laws of nature in any detail. Neither did he focus on the ontology underlying laws. Nevertheless, to be true-to-Hume we require an ontology that both admits of laws of nature (solves the **NOLAWS** objection), *and* accommodates Hume's sceptical worries. Fortunately, so long as no Humean principles are undermined, the open-future Humean is free to argue that nomological facts supervene upon whatever supervenience base she pleases.

Just as Lewis was free to replace the naïve conception with his own, so the open-future Humean is free to implement a 'future-facts-free' system, according to which *current*

[17] Sophisticated Humeanism is more comprehensive than Naive Humeanism in other ways, too; for example, a detailed nominalist account of properties is incorporated into the former. None of this is incompatible with the basic ontological structure of Hume's original metaphysic, though.
[18] See Hütteman (2014)

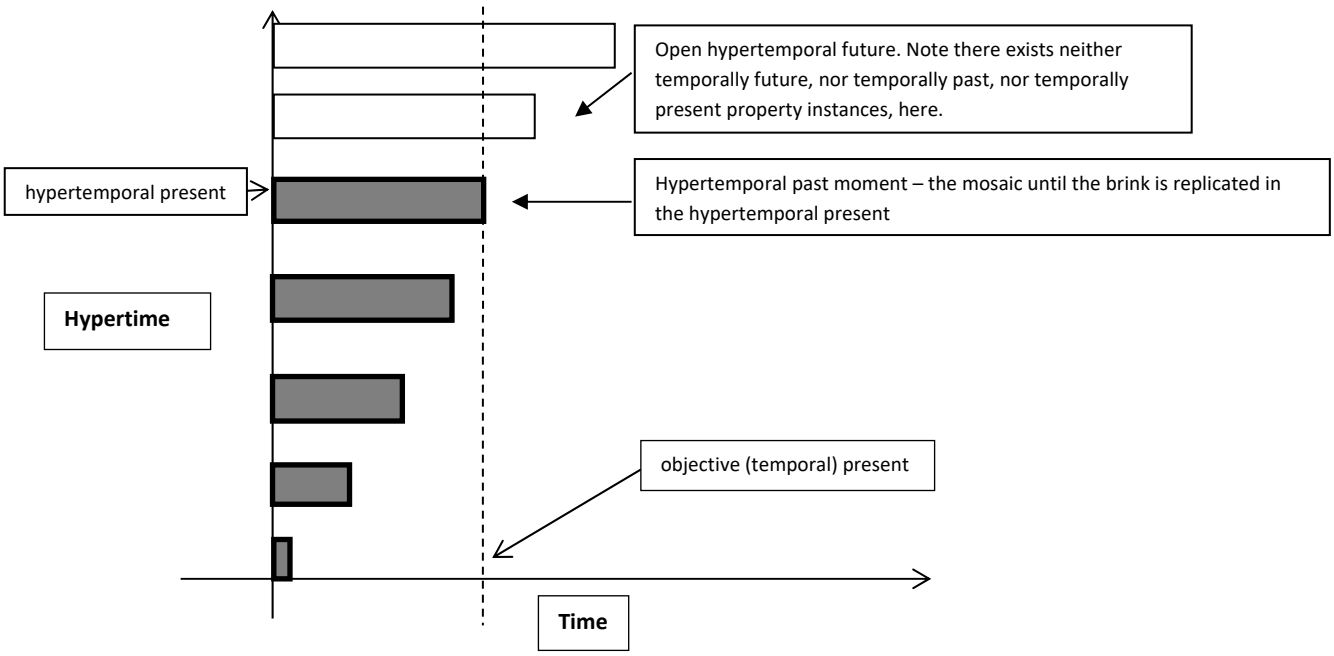
nomological truths (the laws as they are at the present time) supervene upon what exists in the present hypertime, and temporally *previous* nomological truths (which may or may not differ from the current ones) supervene upon the corresponding *previous* hypertimes.

Figure 4 shows that at the hypertemporal present all propositions about future times presently have indeterminate truth values, as the supervenience base does not include future property instances. Nevertheless, since a Humean can apply the best systems analysis to any supervenience base, there is no reason to think that, when determining the current laws of nature, an open-future Humean cannot appeal to a best-systems analysis of laws with a supervenience base comprising only the present hypertime. We are left with the following thesis:

> '*Hypertemporal Humeanism*' : All truths (including nomological truths) at a time *t* supervene upon the mosaic of local particular matters of fact, and the spatiotemporal relations between them, in the hypertime at which *t* is (temporally) present; that is, where *t* is on the brink of the block.

Figure 4[19]

Hypertemporal Humeanism



Hypertemporal Humeans thus take the following to be true:

1. The brink of the hypertemporal present is the final temporal moment of the supervenience base for the current laws of nature.
2. The brink of the each hypertemporal moment is one temporal moment longer than its predecessor.
3. Larger hypertimes come into existence as time flows forward.
4. All temporal moments until the present/brink of each hypertime are real and ontologicially on a par.
5. All nomological truths at a time *t* are derived from the hypertime at which *t* is the final time (where *t* is the brink of the block).

[19] The blocks shaded grey indicates the only existent hypertime (the only 'real' objects are located in the present hypertemporal moment).

Hypertemporal Humeanism thus avoids the metaphysical problem of laws entirely, since no temporally or hypertemporally future facts are necessary for nomological truths. Hypertemporal Humean laws apply to specific hypertimes, where each acts as a distinct supervenience base. Consequently the regularities more strictly translate to: 'All Fs are Gs until *t* (the brink of the '*t*-hypertime'), and this is perfectly compatible with 'All Fs are Gs until *t*, and no Fs are Gs thereafter'. It follows that it is metaphysically possible for the law of electromagnetism to be a law of nature at *t*, and cease to be at subsequent hypertemporal moments.

On the face of it this is extremely troublesome, since nomic necessity loses serious clout. However, although the assumption that the laws will remain the same is implicit in any necessitarian understanding of natural necessity (Armstrong 1983; Bird 2007; Ellis 2001) as well as the most popular Humean conceptions of laws (Lewis 1986), this is arguably precisely the kind of assumption Hume wished to question. Although many do, one need not take 'holds omnitemporally and omnispatially' to be an analytic truth about laws of nature. This notion is, at least on the face of it, distinctly anti-Humean in the 'true-to-Hume' sense described in section two[20]. Consider the following two passages from Hume's *Enquiry*[21]:

1. 'we may define a cause to be *an object, followed by another, and where all the objects, similar to the first, are followed by objects similar to the second.*" (*EHU* 2.7.29)

[20] Humean in the sense that truth supervenes on being; anti-Humean in the sense that Hume himself would not be comfortable with the view.

[21] Hume (1999) *An Enquiry Concerning Human Understanding* Oxford University Press

2. ‘It is impossible… that any arguments from experience can prove the resemblance of the past to the future; since all these arguments are founded on the supposition of that resemblance. Let the course of things be allowed hitherto ever so regular; that alone, without some argument or inference, proves not, that, for the future, it will continue so. In vain do you pretend to have learned the nature of bodies from your past experience. *Their secret nature, and consequently, all their effects and influence, may change, without any change in their sensible qualities*[22].’ (*EHU 4.2.21*)

Hume states (in 2) that the effects of an object can *change*. That is to say (from 1), prior to time *t*, where objects of type C cause objects of type E, an object of type C always has an effect of type E. However, subsequent to time *t* objects of type C might have entirely different effects and influences (not of type E). Hume is *not* denying that objects of type C have effects of type E prior to *t*, rather that its effects change thereafter; what is relevant are the regularities at the time - the regularities of the future are not at all relevant for identifying causes (and *a fortiori* causal laws).

It should now be apparent that an ontology like Hypertemporal Humeanism, whereby laws of nature can change, is more compatible with Hume’s views than Lewis’s alternative. Any objection based on the laws being subject to change, it seems, is not true-to-Hume.

7. Explanation and Prediction

The two main objections to Hypertemporal Humeanism are likely to stem from notions of explanation and prediction, but these kinds of attack are not new to Humean conceptions of laws. I believe the Lewisian about laws can successfully defend herself (Reference removed

[22] My emphasis

for blind review) from the explanation objection, but she would be wrong to think the Hypertemporal Humean cannot do the same.

The relationship between explanation and prediction is clearly an intimate one - if phenomena of type X explain events of type Y, then Xs often help predict Ys. To discover what kind of phenomena justify our inductive inferences, then, it is useful to consider what kinds of phenomena provide good explanations. Accounts of explanation are plentiful. Following Lewis (1986), I am sympathetic to the view that every event (with the possible exception of events such as the spontaneous decay of radioactive particles) has at least one causal explanation, but many argue that nomological explanations can be equally valid (in any case, the two forms of explanation are intrinsically linked). The law of gravitation (alongside certain other desires of mine) explains my desire not to jump off the roof of a third-story building, for example. According to most Humeans, laws are regularities that fit into a best system of law-statements, so the Humeans who admit of *nomological* explanation must grant that at least some regularities have explanatory value. As we see below, though, not all explanatory regularities need be nomological ones.

Suppose Sam is on holiday, fishing in a winding river. On the Monday morning she finds a nice spot in the sunshine (position A) and goes trout-fishing for three hours. Sam catches nine minnows and one trout. She repeats this for three days and the ratio remains the same. On Thursday morning, given the poor trout-minnow ratio over the previous three days Sam chooses a different spot (position B). She catches nine trout and one minnow in her three hours fishing, using the very same bait, tackle, and tactics as before. Sam continues to fish at position B for the next two days and the ratio remains nine-to-one. She concludes that a large difference in the trout-minnow ratio in the fish population between

positions A and B best explains her differing fortunes. Here, Sam is observing a sample (her catch) and inferring the nature of the total population. The regularity 'in the mornings, 90% of fish at position B are trout' serves as an explanation, but it is neither a causal explanation, nor is it a regularity that would fit into the best-systems analysis of laws of nature.

In some contexts, then, one can claim that 'to explain is to include' (that is, sometimes one can explain the properties of a sample by appeal to the properties of the population from which that sample is taken). Going back to our example, there is a perfectly viable, detailed causal explanation for why each individual fish (and *ipso facto* the trout-minnow ratio) was caught. However, the detailed causal explanations of the individual events are less useful to Sam than the regularity explanation of the ratios.

If one grants that to explain can be to include, Hypertemporal Humean laws (as best system regularities at hypertimes) explain many of the events they contain. Furthermore, the Lewisian Humean cannot object to Hypertemporal Humeanism by refusing the above principle, since she relies on it herself (the Lewisian's laws are, ontologically speaking, nothing over and above regularities in the mosaic). In this respect, Hypertemporal Humeanism and Lewisian Humeanism stand or fall together.

8. The Problem of Induction

In this section I do not set out to prove that the Hypertemporal Humean can justify her inductive inferences. Indeed, it seems more true-to-Hume to be very sceptical of inductive inferences. What I do show, however, is that the problem of induction (as an essentially epistemological issue) is no more problematic for the Hypertemporal Humean than for the Lewisian.

For the Lewisian a law is an omnitemporal regularity; that is, a regularity holding from the beginning until the end[23] of time. Consequently if 'All Fs are Gs' is a law then all future Fs, when they are present Fs, will be Gs. For the Hypertemporal Humean however, the law 'All Fs are Gs' does not entail that all future Fs, when present Fs, will be Gs. As already discussed, for the Hypertemporal Humean, the laws as they are now supervene upon the hypertemporal present, and thus nothing about future Fs is *metaphysically* necessitated. Knowing the laws would thus be more informative for the Lewisian (when making inductions) than for the Hypertemporal Humean.

This consequence is undeniable, but not overly problematic for the Hypertemporal Humean, as the thesis triumphs over the Lewisian conception in related respects. Whereas in principle the Hypertemporal Humean *can* know the laws by knowing the thus-far regularities (in principle, it is not subject to the epistemic problem of laws), the Lewisian cannot, as her laws necessarily supervene in part upon unobservable future property-instances. Furthermore, although Hypertemporal Humeanism entails the conditional 'if the laws of tomorrow are the same as those of today, then the regularities of tomorrow will be the same as those of today', this is not the case for the Lewisian. Lewis's laws supervene upon the *complete* mosaic, so it is possible that the law-like 'thus-far' regularities do not hold omnitemporally at all. Consider the following example:

Suppose the law of gravity is a law for the Hypertemporal Humean (at the present hypertime, it forms part of the best system of law statements). It is nonetheless metaphysically possible for her to disappear up into the heavens unaided at the very next hypertemporal moment, for the law of gravity might cease to hold in the hypertemporal

[23] Assuming there is an end of time – if not, then infinitely

future. On the face of it this is a fatal objection, but from an epistemic perspective, the laws can change as much for the Lewisian Humean as they can for the Hypertemporal Humean. There are many Lewisian Humean possible worlds that resemble the world described above; that is, the law of gravity looks to hold until *t* but then breaks down. For the Lewisian, the laws of nature could never have changed, of course, but the law of gravity would never have been a law in the first place. This, I assume, would be of scant consolation to the Lewisians shooting up into the heavens!

In short, the Hypertemoral Humean's laws entail very little about future physical states of affairs, since nomological facts supervene upon a mosaic devoid of future property instantiations. Given this implication, it looks very difficult for the Hypertemporal Humean to justify any inductive inferences. The Lewisian (although her laws do entail future regularities), however, *must* grant that she may be wrong about the laws, since laws of nature are, at least in part, fixed by unobservable future events.

One might argue that 'inference to the best explanation' permits the Lewisian to claim that 'thus-far' regularities/laws are likely to be the omnitemporal regularities/laws (see Beebee 2011), since the best explanation for the thus-far regularities is that the actual world is (omnitemporally) uniform. However (somewhat ironically) one can look to Helen Beebee's argument against a necessitarian objection to Humeanism *simpliciter*, to see why this argument fails. Beebee writes:

> …in the context of inductive inference our *explanandum* is not regularitity *simpliciter*, what calls for explanation is not that all *F*s are *G*s, but that so-far *observed F*s have been *G*s. For of course, prior to a satisfactory solution to the

> problem of induction, the fact that *all Fs are Gs* is not yet something that calls for explanation, since we do not yet have any reason to suppose it is a fact. (2011, 509)

This passage forms part of a response to Armstrong's (1983) objection to Humeanism, in which he claims that whereas the Humean is neither able to justifiably infer laws nor make inductions, those who invoke natural necessitation relations between universals can do both. Armstrong claims that the best explicans for uniformities in nature are governing laws, and thus that inference to the best explanation leads one to the inductive-inference-justifying necessitation relation; if the Humean cannot make a similar move, then Humeanism looks well beaten with respect to the problem of induction.

Beebee's[24] response successfully diffuses Armstrong's argument, so one should happily grant that the Lewisian is in at least as good a position to make inductions as Armstrong is. Nonetheless, in order to use her laws the Lewisian must allow for arguments such as **INDUCT** below to (at least sometimes) be *inductively valid*[25] - how else could she infer her omnitemporal regularities?

INDUCT

1. All observed Fs (when there are many) are Gs
2. We have no reason to suppose the next F will *not* be a G
3. The next F will be a G

If one will allow the Lewisian to utilise **INDUCT**, the same courtesy should be afforded to the open-future Humean; that is, if one can apply **INDUCT** to the Lewisian conception, one can apply it to the Hypertemporal Humean laws of the present and past hypertimes, and thus justifiably assume that tomorrow's Hypertempotal Humean laws will be the same as

[24] See also [reference removed for blind review] for a similar response.
[25] The premises, at the very least, provide *support* for the conclusion.

today's. The open-future Humean's inductions are thus *as justified as* those of the Lewisian, regardless of how well or poorly the Lewisian's inductions really are. Although I am far from convinced that either the Hypertemporal Humean or the Lewisian genuinely *can* provide good justification for their inductions, in this respect, Hypertemporal Humeanism and Lewis's Humeanism are on a par.

9. Conclusion

On the face of it open-future Humeanism is significantly worse off than the Lewisian with respect to laws, explanation and induction. However, on closer inspection the open-future Humean can legitimately propose an alternative to Lewis's Humeanism, which fares no worse than the Lewisian in those domains. Hypertemporal Humeanism provides a metaphysic that affords a dynamic present moment, leaves the truth-values of future contingents (presently) indeterminate, and maintains the central tenets of Humeanism, all without susceptibility to the metaphysical problem of laws.

No doubt some will remain unconvinced that Hypertemporal Humean laws satisfy the criteria for laws of nature, since it is metaphysically possible for them to change at the very next hypertemporal moment. To those philosophers I say: "you are not true-to-Hume about laws". The passage quoted from *The Enquiry* in section *4* suggests that Hume believed 'the secret nature' of bodies from past experience can change over time, along with their 'effects and influence'. This is not a denial of causation in the presence of change (as one might think, given the stress on 'constant conjunction' elsewhere), but an acceptance that the effects of a given cause might change over time[26]. If one is to be true to Hume, one must

[26] C was a cause of F until time *t* because C was constantly conjoined with F until *t*; thereafter, C was a cause of G, but not F, since C became constantly conjoined with G for a sufficient amount of time since *t* (giving an idea of necessary connexion between C and G), and the constant conjunction between C and F had broken down.

apply the same principles to laws of nature; it is logically possible for the laws to change, but that is not to say that there are no laws of nature.

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